Joint Base Lewis-McChord (JBLM)

JOINT BASE LEWIS-McCHORD
SOLDIERS & AIRMEN DEFENDING AMERICA

Innovations in Facility Energy Improvements

Energy-Efficiency at JBLM:
An Innovative Partnership

A BPA panel discussion featuring:

- **Brad Miller**
- **Tim Steele**
- **Todd Amundson**

FUPWG 2011 Spring Meeting
April 20, 2011

Where is JBLM

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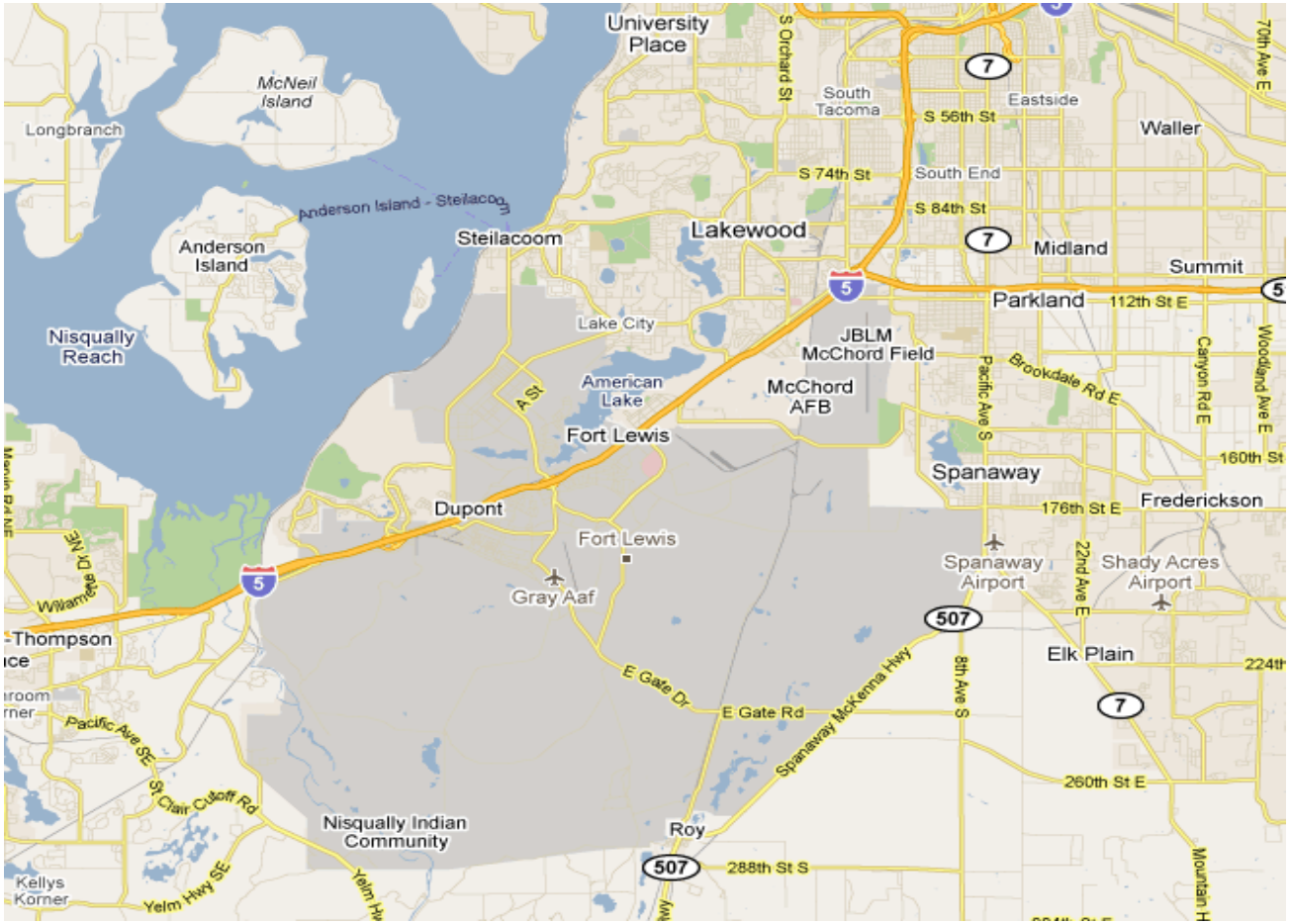
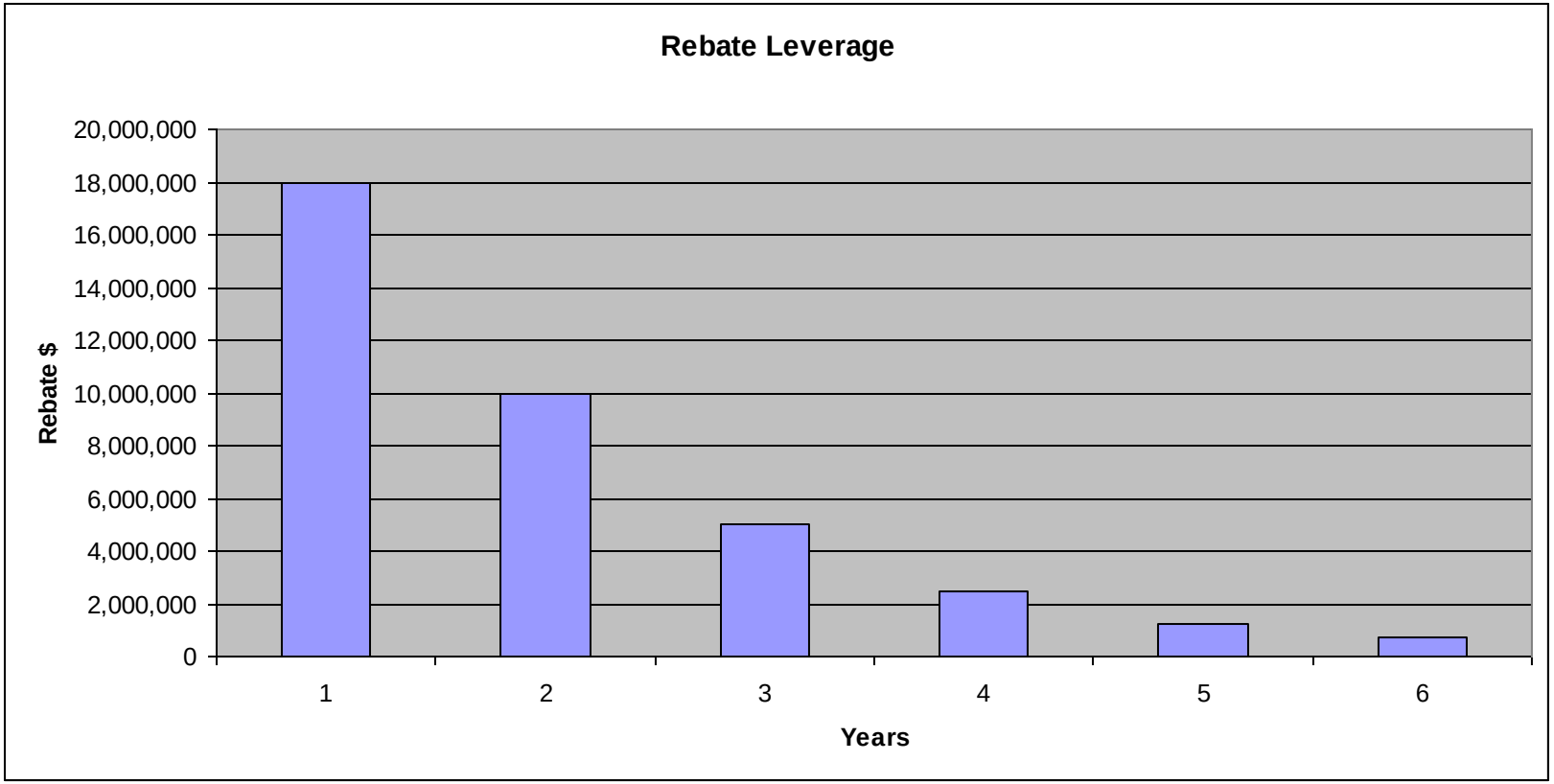


JBLM Energy Efficiency History

Where did this come from	
Early History – Prior Players	
UESC Signed	Sept 2007
Initial Financing for $18M	Dec 2008
Refinancing of Loan, saving $723,000	July 2010
Project Planning Assistant hired	Dec 2010

Utility Rebate Leverage



Current Savings Summary

Electrical	kWh
Completed	3,014,537
Active	5,137,730
Total	**8,152,267**
Savings/yr	**$339,134**

Natural Gas	MBTU
Completed	35,852
Active	92,916
Total	**128,768**
Savings/yr	**$901,586**

Current and Active Project Totals: 156,584 MBTU/year

$1,240,720/year

Near Term Savings Projection

Electrical	kWh
Completed	3,014,537
Active	5,137,730
Subtotal	8,152,267
Audit 4/5 (Estimated)	2,165,214
Total	**10,317,481**
Savings/yr	**$429,207**

Natural Gas	MBTU
Completed	35,852
Active	92,916
Subtotal	128,768
Audit 4/5 (Estimated)	42,311
Total	**171,079**
Savings/yr	**$1,197,553**

Current, Active and Pipeline Project Totals: 206,284 MBTU/year

$1,626,760/year

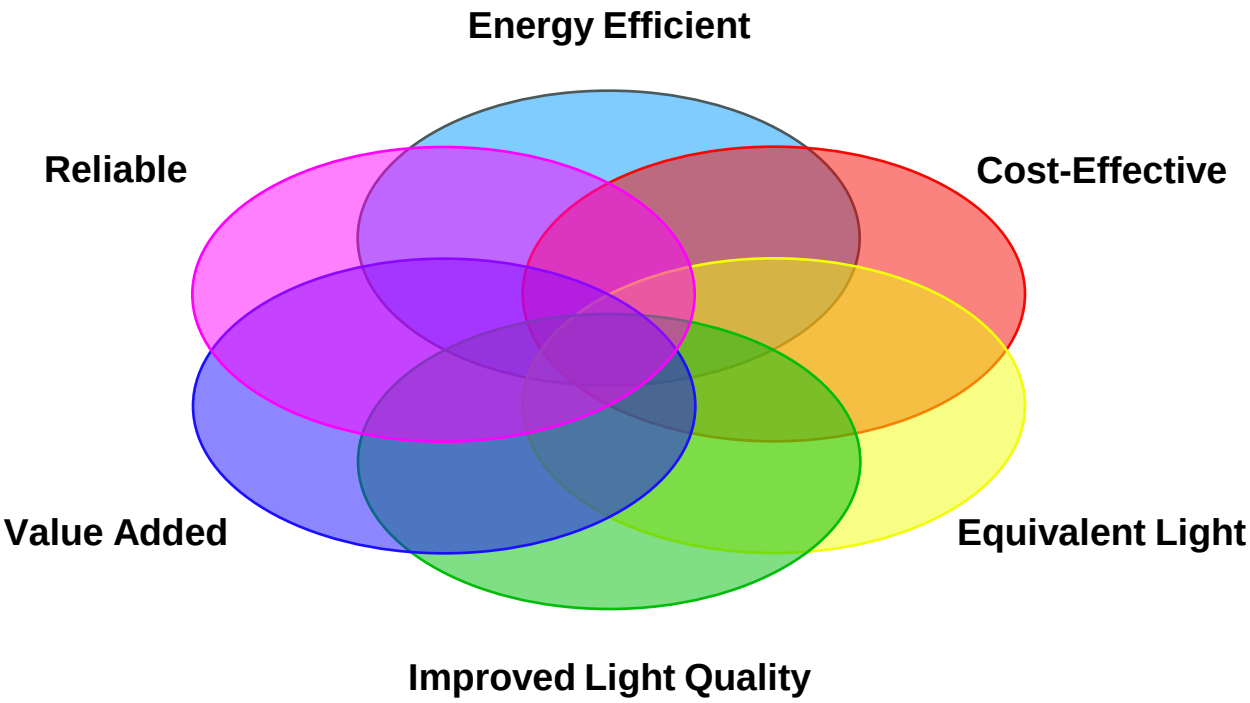
Example JBLM Projects

- **Innovative Lighting at JBLM – Tim Steele**
- **Steam Side Savings – Todd Amundson**

Innovative Lighting at JBLM

Tim Steele, Energy Efficiency Engineer

"Innovative" Lighting Retrofit Projects



Technologies Used:

- Induction
- LED
- T5HO
- High Performance T8
- Occupancy Sensors

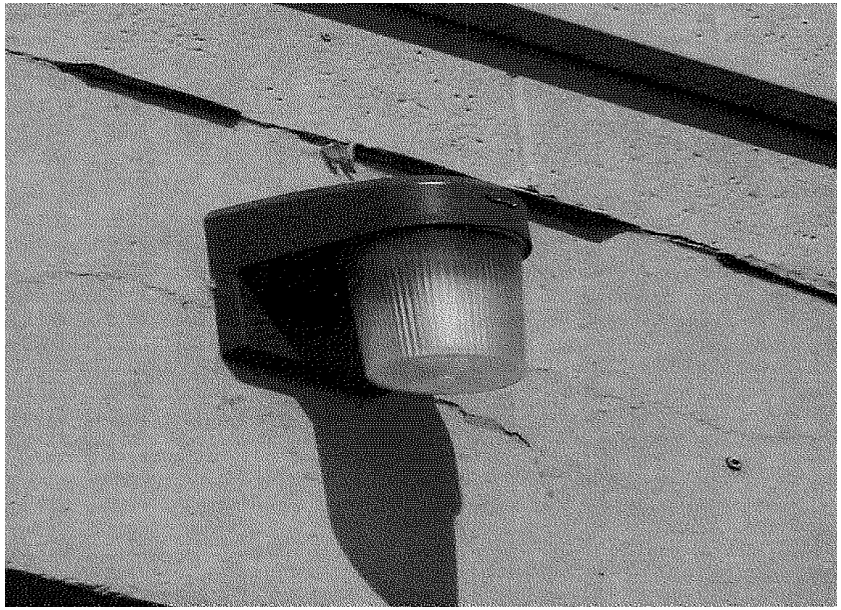
Induction Lighting - PX

Before

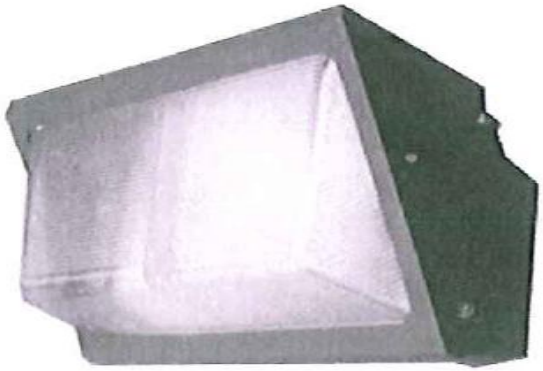
After

Replace existing 400 watt Metal Halide with 200 watt Induction: Increased measured light levels, increased light “quality” and reduced energy use by over 50%.

Induction Lighting – Exterior/Security



Existing – 26 Watt CFL



New – 40 Watt Induction

Increased light output

Long life

LED – Gas Station Canopies

Pre: 400 Watt Metal Halide

Post: 50 Watt LED + 30 Watt LED Aimable

- Reduced energy use and increased lighting quality.

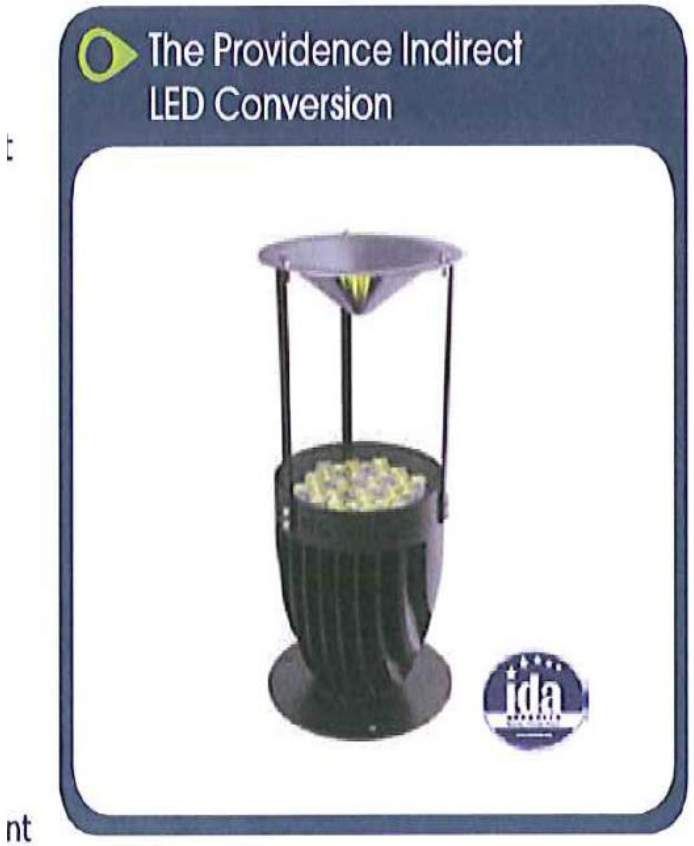
LED Post Tops

Area 1

Area 2

LED Post Top Retrofit

- Retrofit 150 – 175 watt Metal Halide and HPS walkway fixtures with 80 watt LED conversion kit.
- Reduced night-time glare.



Warehouse Lighting

- Warehouses built in 1940's
- Very low measured light levels: 6 – 12 fc
- 3FT40DL (100 watt input power) and 200 Watt HPS high bay fixtures existing
- 12 foot ceilings perimeter
- 40 foot ceilings w/clerestory interior center
- Circuit breaker control
- What to do?

Warehouse Lighting (T5HO Retrofit)

- Replaced existing with 2-lamp T5HO fixtures with occupancy sensors. Added daylight sensor option to center aisle fixtures.
- Reduced lighting power in one building; significantly reduced lighting hours of operation in both.
- Significant reduction in maintenance costs.
- 560,000 kWh/yr energy saved
- 4 year payback (25% ROI)

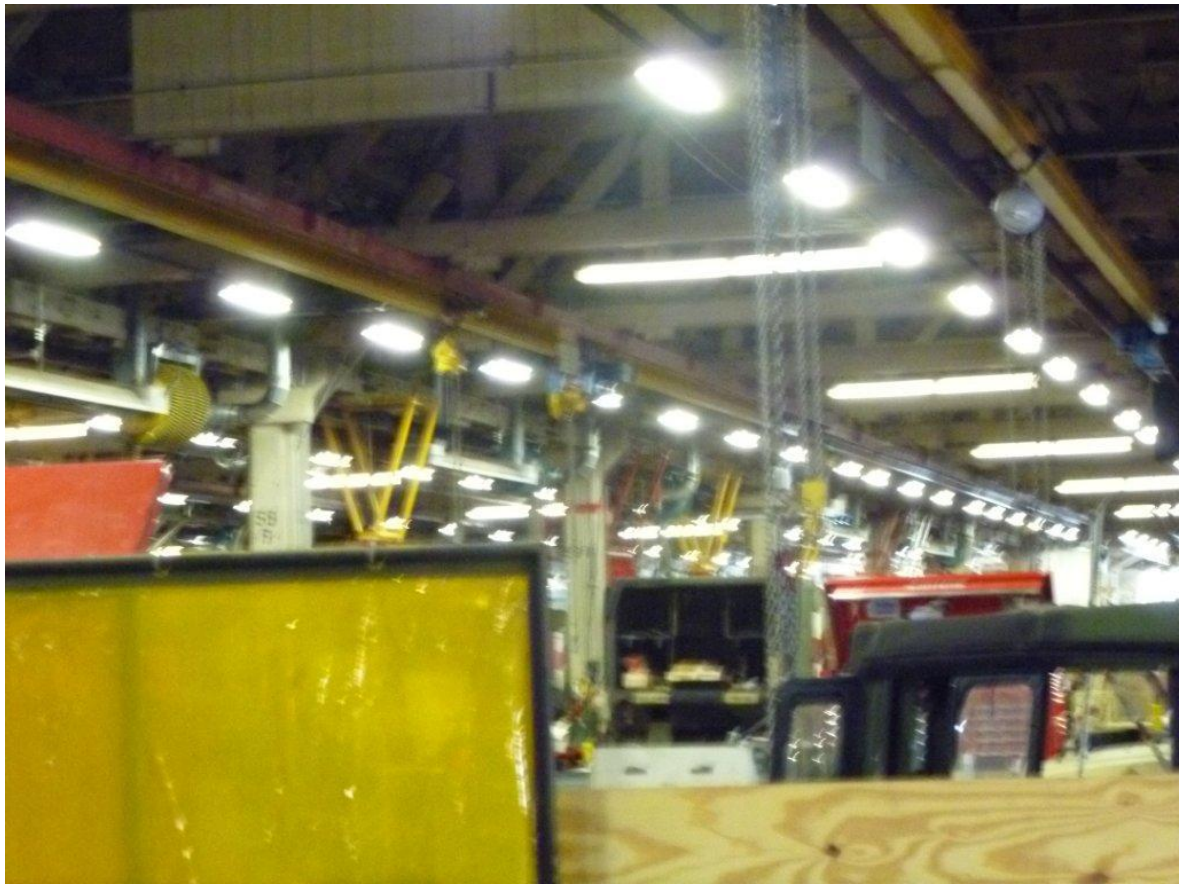
Bldg 9630 – Warehouse	Measured Light Levels (Footcandles		
Lower Ceiling	**Pre**	**Post**	**Change +/-**
Under Fixture	6.6	27.2	312%
Between Two New Fix's	5.0	18.0	260%
Upper Ceiling			
Under Fixture	24.8	61.0	146%
Between Two New Fix's	21.0	35.9	71%

Warehouse Building 9580

- Replaced (840) existing “Sports Light” fixtures, 8 x 26 watt CFL, with 2-lamp T5HO fixtures
- Benefits:
  - Reduced fixture wattage by 50%
  - Doubled measured light levels (from 10 fc to 20 fc)
  - Significantly reduced lighting maintenance costs.
  - 2 year payback (50% ROI).

Warehouse Building 9580

Post Retrofit



PX Sales Area

Pre: 4-lamp T8

55 – 60 FC

Post: 2-lamp High Perf. T8 w/HLO ballast

60 – 65 FC

Reduced lighting energy use by ~50% and improved quality

Administration Buildings

High Performance T8s w/ Occ. Sensors

- Existing 3-lamp deep cell parabolic fixtures with inboard/outboard dual wall switch control.
- Retrofit with 2-lamp high performance T8 retrofit kit.
- Replaced wall sensors with occupancy sensors or installed ceiling sensor.
  - Reduced fixture wattage by 35% (90 watts to 58 watts).
  - Maintained light levels
  - Reduced maintenance costs
  - Improved light quality
  - Payback < 9 years (12% ROI)

Conclusion

- Lighting systems can be retrofit cost-effectively with the added benefits of:
  - Reduced Maintenance Costs
  - Improved Lighting Quality

Steam Projects at JBLM

Todd Amundson, Energy Efficiency Engineer

JBLM Steam System Discussion Items

- Completed Steam Projects → Gas Savings
- Active Steam Projects → Gas Savings
- Steam Demand Savings Project Example
- Steam Trap and Energy Management

Steam Usage (Demand) at JBLM

- **Building Heating**
- **Domestic Water Heating**
- **Absorption Chillers**
- **Logistics Area Industrial Processes**
- **Losses**

Steam Supply at JBLM

- **Hundred's of Smaller (<200,000 to 5,000,000 BTU) Natural Gas Fired Boilers**
- **Six Central Steam Plants, each with multiple packaged boiler units ranging from 150 HP up to 800 HP nameplate capacity**

Steam →Natural Gas Savings to Date

Completed Projects	MBTU Saved
DO-1 Lighting/HVAC	28,052
DO-3 Boiler Tune ups (100)	7,800
Total Completed:	**35,852**
Cost Savings:	**$250,964 per year**

Steam →Natural Gas Savings Active Projects

Active Projects	MBTU Saved (Estimated)
DO-10 Steam Eye Monitoring	11,600
DO-12 Steam Plant ***(Steam Traps Losses)***	14,243 ***(42,527)***
DO-13 HVAC	9,322
DO-15 HVAC	8,282
DO-16 Boiler Tune ups (89)	6,942
Total Estimated:	**92,916**
Cost Savings	**$650,412 per year**

Dollar Loss for a Single Trap[1]

- **Annualized dollar loss at $12.50/1,000 pounds**
  - **assuming an 1/8th inch orifice (.125”) at various pressures:**

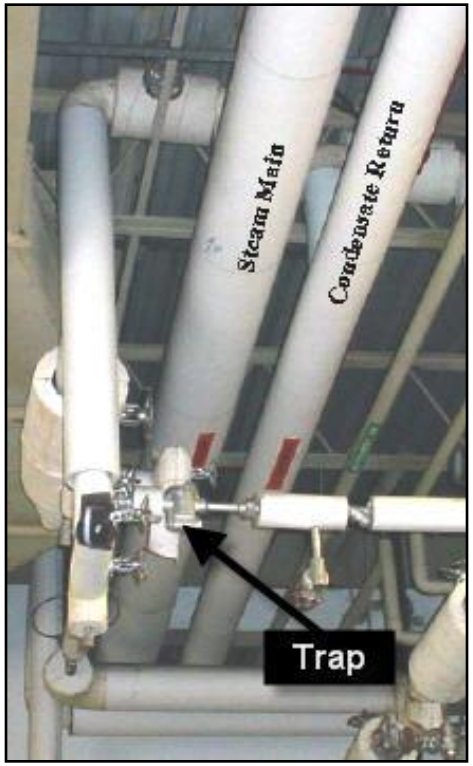
Pressure	Lost Steam	Annual loss	Cost
– 15 PSI	12 lb/hr	105,120/yr	$1,314
– 30 PSI	19 lb/hr	166,440/yr	$2,080
– 60 PSI	31 lb/hr	271,560/yr	$3,394
– 125 PSI	58 lb/hr	508,080/yr	$6,351

Note:

1. Loss and Cost Estimates Provided by Armstrong/US2

Steam Demand Reduction & Management

- Reducing Losses, Estimated Energy Savings are:
  - **42,527 MBTU first year**
  - **11,600 MBTU annually**
- Steam Trap Replacements, Repairs & Monitoring System Cost Total ~$2.4M
  - **Steam trap replacement**
  - **Pipe insulation repair**
  - **Leak and Valve repairs**
  - **New Monitoring System on High, Medium Pressure Traps**
- Payback Period of 4 (25% ROI) years before utility incentives



How SteamEye® Monitoring Functions in a Trap Field:

- Tracks 2,000 traps real-time
- Senses temp, sound, conductivity
- Alarms on trap failure
- Shows when, where, how failed
- Signal does not disrupt RF
- Talks to BAS and DCS systems

Unique Features of JBLM Steam Trap Monitoring System

3 + 2 year service agreement to maintain savings

Design features:

- A web-enabled system gives real time status report of traps
- Steam tunnel traps are monitored with above ground transmitters
- Medium pressure traps are monitored by acoustic bolt-on sensors

Noteworthy solutions:

- Low pressure traps are monitored without using transmitters – but using knowledge of MTBF and install date
- A monitored trap service agreement to ensure timely correction of system faults and ensure savings.
- The system is expandable to include new traps as the steam system evolves.

JBLM SteamEye® Screen Snapshot:

What, when, where and how it failed

Armstrong Intelligent System Solutions™ STEAM · AIR · HOT WATER

SteamEye®

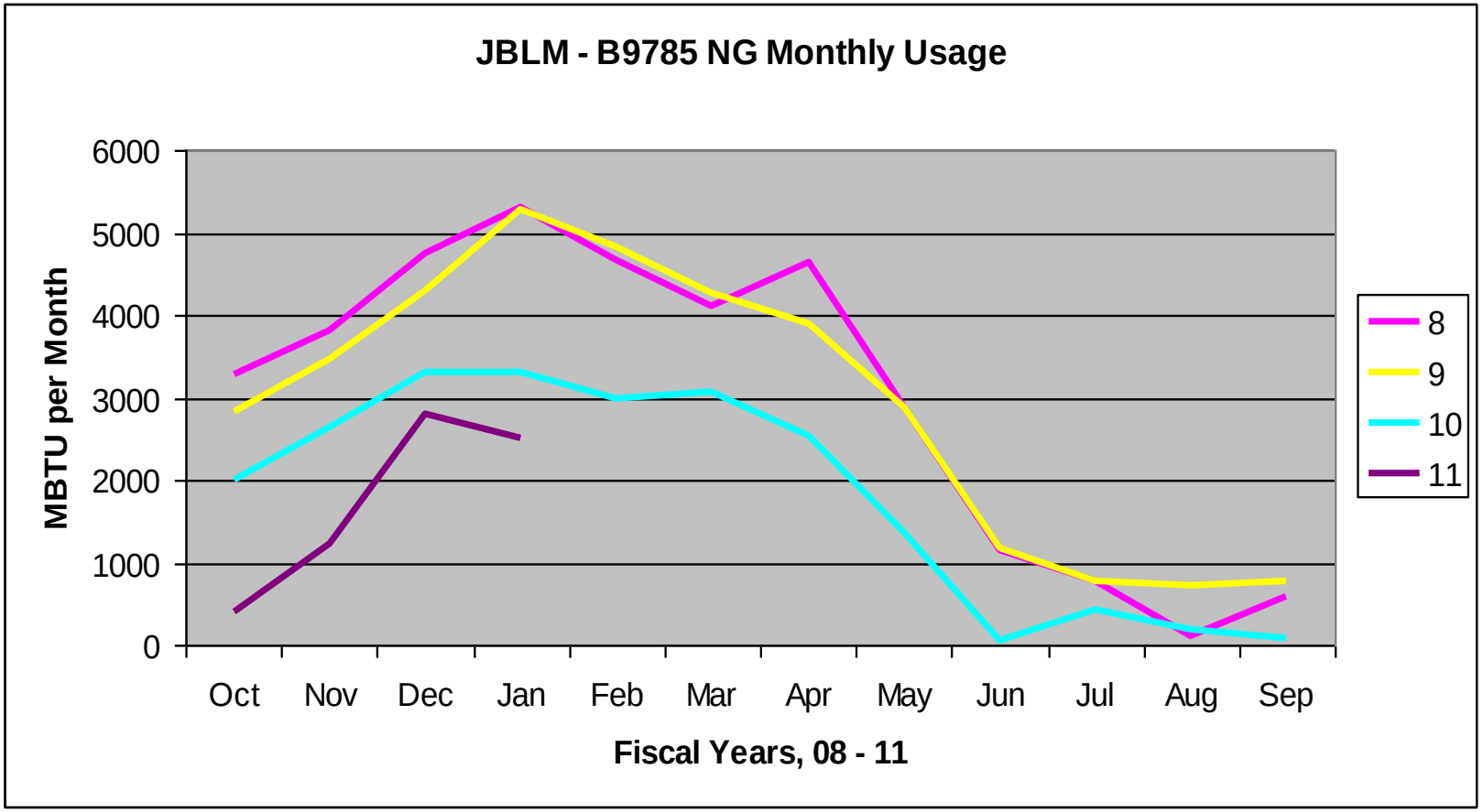
Critical Equipment | Failed Equipment | **All Equipment** | Configuration | Logout | Plant_3LC

All Equipment

Device Type Select Device to Filter

Tag#	Tx#	Location	Type	Model No.	Status	Battery	Radio	# State Changes	Last Report	Previous Report - State	Cycle Count
748	16302801	BLDG. 09570 Bay 2 caged area @ Col 39	Steam Trap	ARM / 811	OK	OK	1	1	Mon Apr 11 21:08:56 2011	No Data	N/A
749	16301283	PLANT 3LC, BLDG. 09570 BAY 2 @ COLUMN 39	Steam Trap	ARM / 800	OK	OK	39	1	Mon Apr 11 21:07:26 2011	No Data	N/A
751	16301871	Bldg 09570 Near Col 24	Steam Trap	ARM / 811	OK	OK	0	1	Mon Apr 11 21:06:43 2011	No Data	N/A
752	16301863	Bldg 09570 Carpenter Shop Paint Rm	Steam Trap	ARM / 811	OK	OK	10	1	Mon Apr 11 21:08:20 2011	No Data	N/A
753	16301675	Bldg 09570 Carpenter Shop Above Office	Steam Trap	ARM / 800	OK	OK	4	3	Mon Apr 11 21:07:55 2011	Wed Mar 23 01:58:38 2011 - BT	N/A
754	16302914	Bldg 09570 Carpenter shop NW Unit Htr	Steam Trap	ARM / 811	OK	OK	0	1	Mon Apr 11 21:06:49 2011	No Data	N/A

Energy Tracking: One Example at Central Plant



Baseline – Post-Project MBTU/yr = 15,500 MBTU/yr Savings

Possible Future Work

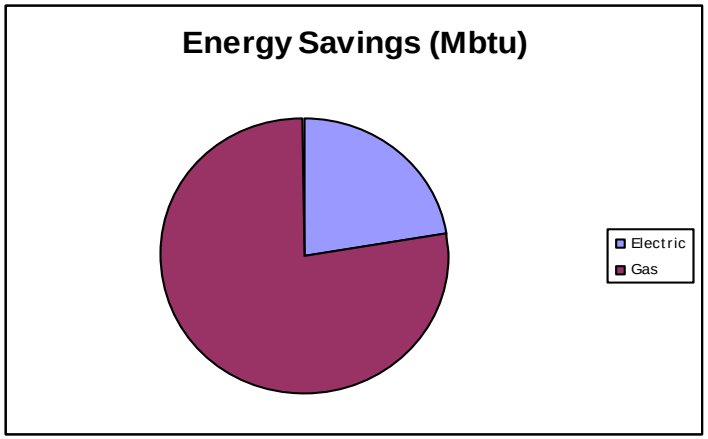
Pipeline/Future Work

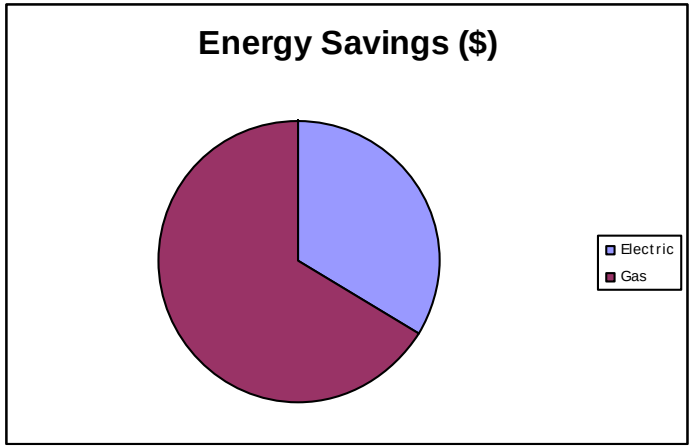
Future Work	Buildings
Audit 4 – Complete Review & Analysis	22
Audit 5 – Complete Review & Analysis	10
Audit 6 – Level 2 Audits	11
Level 1 Audits (Rest of Base)	273
Total Buildings:	**306**

Future Work

273 Building Audit Pre-work Estimate	
Cost of Construction	$20,500,000
Savings (MBTU)	176,000
Savings (kWh)	21,745,100
Savings/yr ($)	$1,704,000
Estimated Rebate	$10,282,650

Future Project Total Estimated Targets





Estimated Targets	
Energy Savings (MBTU)	382,000
Energy Savings ($/yr)*	$3,943,960
Rebates (Estimated)	$16,967,433

BPA Organization

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